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Process and apparatus for producing consumable
products

The invention relates to a process for producing consumable products having an outer shell made from a substance which is introduced into a mold, into which a temperature-controlled ram then moves, as well as a corresponding apparatus.

DE 197 20 844 C1, by way of example, describes a process and an apparatus for producing consumable products having an outer shell which is produced in extruded form by a temperature-controlled ram moving into a mould, with the dew point of the atmosphere surrounding the consumable product being kept below the temperature of the ram.

It is not possible in this process to determine the mass of chocolate with sufficient accuracy for the edge of the confectionary product to end flush with the edge of the mould. To form a smooth, planar edge, in many cases more chocolate substance than necessary is introduced into a mould cavity. This extra chocolate then emerges over the edge of the mould and has to be removed either using a blade or in some other way. This is a laborious operation and requires an additional working step.

The present invention is based on the object of developing a process and an apparatus of the type described above which guarantee the elimination of inclusions of air from the mould cavity.

This object is achieved by the fact that the substance is placed under pressure after the ram has moved in.

This means that after the ram has moved in inclusions of air are forced out or spaces which have not hitherto been filled by the chocolate substance are filled.

In an exemplary embodiment, a displacement ram which is guided in an axial bore in the actual shaping ram is used. After the shaping ram has been lowered into the mould space, this displacement ram is placed under a slight pressure, so that it emerges from the shaping ram and presses the chocolate substance in such a way that spaces which have not yet been filled are filled.

In a preferred exemplary embodiment, it is provided that the displacement ram is retracted slightly into its bore in the shaping ram during the movement into the chocolate substance, so as to form an additional space for chocolate substance. After it has been lowered, the displacement ram is guided in such a way that the chocolate substance located in the

additional space is forced out. Ultimately, the end face of the displacement ram lies in the same plane as the shaping ram. This prevents, for example, the base of a shell from being slightly thinner than the side walls.

In a further exemplary embodiment of the invention, consideration is given to connecting a bore in the shaping ram to a pressure source. An example of a suitable pressure source is gas, but other pressure media are also conceivable.

If the shaping ram is then lowered into the mould space, the chocolate substance is displaced. To ensure that chocolate substance does not simply penetrate into the bore with the pressure medium, this bore is filled with pressure medium under a predetermined pressure.

At the end of the molding operation, the pressure is increased, so that the chocolate substance in front of the opening of the bore is placed under pressure by the pressure medium and cavities can be filled.

In a further exemplary embodiment of the invention, the shaping part of the shaping ram is made from an elastic material. Suitable materials for this purpose include all conceivable elastic materials, which may also include relatively thick, metallic foils which can stretch to a

certain extent. Of course, consideration may be given in particular to plastic.

The interior of the ram and in particular the elastic part of the ram is filled with a pressure medium which is under a predetermined pressure, so that the elastic part adopts the desired internal shape of the shell. The pressure medium used is preferably cooling liquid.

After the ram has been lowered into the mould space, the pressure on the cooling medium is then increased, so that the elastic part of the shaping ram expands to a certain extent. As a result, a pressure is exerted on the chocolate substance, so that the last free cavities in the mould space are filled.

Consideration may also be given to making only part of the shaping ram elastic. For this purpose, the inherently rigid shaping ram part has an opening which is closed off by an elastic diaphragm. A pressure medium once again applies a preset pressure to the diaphragm, such that the diaphragm does not stretch. It is preferable for the diaphragm to be curved inward. The pressure medium used in this case too is preferably cooling liquid.

After the shaping ram has been lowered, the pressure on the cooling liquid is then increased, so that the diaphragm is expanded or preferably made to curve outward, with the result that chocolate substance located in front of the diaphragm is displaced and inclusions of air are closed up.

Further advantages, features and details of the invention will emerge from the following description of preferred exemplary embodiments and with reference to the drawing, in which:

Figures 1.1 to 1.3 show partial cross sections through an apparatus according to the invention for the production of chocolate shells;

Figures 2.1 to 2.3 show enlarged excerpts from Figures 1.1 to 1.3 in regions A, B and C;

Figures 3.1 to 3.3 show partial cross sections through a further exemplary embodiment of an apparatus according to the invention for the production of chocolate shells;

Figure 4 shows an enlarged excerpt from Figure 2.3 in region D;

Figures 5.1 to 5.3 show partial cross sections through a further exemplary embodiment of an apparatus according to the invention for the production of chocolate shells in various positions of use;

Figures 6.1 to 6.3 show partial cross sections through a further exemplary embodiment of an apparatus according to the invention for the production of chocolate shells in various positions of use;

Figures 7.1 to 7.3 show enlarged excerpts from Figures 6.1 to 6.3 in regions E, F and G.

Figures 1.1 to 1.3, 3.1 to 3.3, 5.1 to 5.3 and 6.1 to 6.3 show a mould plate 2, at which there is a ram 3.1, of an apparatus for producing chocolate shells 1. Opposite the ram 3.1 there is a mould 4 in which a mould cavity 5 is formed.

An axial bore 6 in which a displacement ram 7 is guided passes through the ram 3.1. The displacement ram 7 is sealed off with respect to the ram 3.1 by an O ring 8. Furthermore, an annular space 9, in which cooling water 20 is guided, is provided around the displacement ram 7.

The present invention in accordance with Figures 1.1 to 1.3 functions as follows:

In accordance with Figure 1.1, a chocolate substance 10 is located in the mould space 5. The cooled ram 3.1, which is arranged at the mould plate 2, is lowered with the latter and together with the mould space 5 forms a space in which the chocolate shell 1 is at least partially formed, in accordance with Figure 1.2. A shoulder 11 of the ram 3.1 bears against an annular edge 12 of the mould 4.

It is preferable for slightly less chocolate substance 10 to be introduced into the mould space 5, so that air inclusions 13 result when forming the space for the chocolate shell 1 in accordance with Figure 1.2. To then expel these air inclusions, the displacement ram 7 is lowered, as shown in Figure 1.3. It moves into the chocolate substance and displaces the latter in such a way as to expel the inclusions of air.

An improved option as shown in Figures 2.1 to 2.3 provides for the displacement ram 7 to be slightly retracted when the ram 3.1 is moving into the chocolate substance 5, so as to form a vertex space 14 in which chocolate substance can collect. When the displacement ram 7 is lowered, it is moved into the plane of the ram 3.1, so that the chocolate substance is forced out of the vertex space 14. This amount of chocolate is sufficient to expel the inclusions of air.

A second possible form of the present invention is illustrated in Figures 3.1 to 3.3. In this case, a ram 3.2 passes through a bore 15 or a corresponding tube which is in communication with a gas connection. After the ram 3.2 has been lowered into the mould space 5 as shown in Figure 3.2, gas 21 is supplied through the tube 15, so that a certain amount of chocolate substance is displaced in front of the vertex 16 of the ram 3.2, so as to form a free space 17. This is illustrated in Figure 4.

In a third option as shown in Figures 5.1 to 5.3, there is provision for a ram 3.3 to be designed in the form of a shell, with an interior space 18 surrounded by a shell-shaped sheath 19. This sheath 19 is flexible to a certain extent.

When the ram 3.3 is lowered as shown in Figure 5.2, cooling water 20 which is under a defined pressure p_1 is applied to the interior space 18. After the ram 3.3 has molded the shell 1 as far as possible, the pressure of the cooling water is increased to a pressure p_2 , with the result that the elastic sheath 19 is expanded to a certain extent. The inclusions of air are expelled as a result.

In a fourth option as shown in Figures 6.1 to 6.3, the ram 3.4 is in the shape of a shell but is to a large extent

produced from a rigid material. Cooling water 20 is guided in its interior.

In the vertex region, the ram 3.4 has an opening 22 which is covered by a diaphragm 23. As can be seen in particular from Figure 7.1, the diaphragm 23 curves inward.

In accordance with Figure 6.2, the ram 3.4 is lowered into the chocolate substance 10 so as to form the shell together with air inclusions 13. During this process step, the pressure p_1 on the cooling water 20 is maintained.

For this reason, the diaphragm 23 remains in the inwardly curved form which can be seen from Figure 7.2. As a result, an additional pocket of chocolate 24 is formed toward the shell 1.

Then, as shown in Figure 6.3, the pressure on the cooling water is increased to a pressure p_2 , so that the diaphragm 23 curves outward, as can be seen from Figure 7.3. In the process, the diaphragm 23 forces the chocolate out of the chocolate pocket 24, so that inclusions of air 13 can be eliminated.

List of reference numerals

1	Chocolate shell
2	Mould plate
3	Ram
4	Mould
5	Mould space
6	Axial bore
7	Displacement ram
8	O ring
9	Annular space
10	Chocolate substance
11	Shoulder
12	Annular edge
13	Air inclusion
14	Vertex space
15	Tube
16	Vertex
17	Free space
18	Interior space
19	Sheath
20	Cooling water
21	Gas
22	Opening
23	Diaphragm
24	Chocolate pocket